Abstract

Objective: Promoting a traditional Mexican diet (TMexD) could potentially reduce high rates of non-communicable diseases (NCDs) and support food sustainability in Mexico. This study aimed to develop an index to assess adherence to the TMexD.

Design: A three-round Delphi study was conducted to examine the food groups, specific foods, and food-related habits that would constitute a TMexD index. Participants selected the TMexD items using Likert scales, lists of responses, and yes/no questions. Consensus was determined using percentages of agreement, mean values and/or coefficients of variation.

Setting: Online Delphi study.

Participants: Seventeen nutrition and food experts in Mexico completed all three rounds.

Results: The resulting index (ranging from 0 to 21 points) consisted of 15 food groups, containing 102 individual foods. Food groups included in higher quantities were maize, other grains, legumes, vegetables, fruits, herbs, nuts and seeds, and tubers. Animal foods, vegetable fats and oils, home-made beverages, maize-based dishes, and plain water were also included, but in lower quantities. The food-related habits included were consuming home-made meals, socialising at meals, and buying food in local markets. Consensus was reached for all index items apart from quantities of consumption of six food groups (herbs, nuts, grains, tubers, dairy, and eggs).

Conclusions: Although future research could improve the measures for which consensus was not reached, the TMexD index proposed in this study potentially displays a healthy and sustainable dietary pattern and could be used to examine links between the TMexD and health outcomes in Mexican populations.

Keywords: Traditional Mexican diet, Delphi technique, sustainable diet, dietary pattern index.

Introduction

Both in Mexico and globally, non-communicable diseases (NCDs) are considered major public health concerns[1–3]. However, the proportion of the Mexican population meeting dietary guidelines remains low[4,5], and dietary factors pose among the highest risks for disability-adjusted life-years (DALYs)[6,7]. According to international health organisations, promoting traditional diets, which refer to dietary patterns influenced by the food culture of the region, could reduce high NCD rates worldwide[8,9]. Traditional diets are not only considered compatible with health[10,11], but also potentially sustainable, as they are culturally sensitive, promote biodiversity, food security, support local economies, and have a low environmental impact[9].

The traditional Mexican diet (TMexD) could potentially be promoted as a healthy and sustainable diet in Mexico. However, the different definitions of the TMexD have hampered the examination of the association of this dietary pattern with health and food sustainability outcomes. To date, a concise tool to assess adherence to the TMexD does not exist, as the available tools[12,13] do not measure all relevant food groups or do not provide information on the specific quantities for all food groups represented[14]. Although a recent systematic review highlighted the foods characterised as 'traditionally Mexican', some clarification is still needed to measure adherence to this dietary pattern[14]. For instance, it is uncertain whether including some products typically consumed in Mexico in ancient times (e.g., insects) would be currently feasible. Likewise, the quantities in which food groups are consumed in the TMexD still needs to be established. Complementary methodologies are needed to objectively develop a concise but comprehensive TMexD index. The Delphi technique could address this objective, as it constitutes an iterative process where experts on a specific subject discuss and reach a consensus on complex and unclear matters[15–19].

The current study aimed to develop, by using the Delphi technique, an index to measure adherence to the TMexD. In this study, nutrition and food experts in Mexico were invited to achieve consensus on the elements to be included in an index that measures adherence to the TMexD in healthy adults (aged≥20 years, as defined in the Mexican National Health and Nutrition Survey[20]). Specifically, the main objective was to determine the food groups which need to be represented in the TMexD index. Secondary objectives were to identify the food quantities, food-related habits, and specific individual foods that accurately reflect a TMexD and that should be included in the index.

Methods

This study used a modified Delphi approach to develop the TMexD index. Broadly, the Delphi method consists of consecutive questionnaires or 'rounds'. During the first round, experts complete

an initial questionnaire and receive feedback, which generally includes basic descriptive statistics and qualitative feedback representing the responses of the group. In this study, we provided participants with qualitative feedback and statistical data (represented as graphical data) on their own responses and the group's responses, as recommended in the literature[18,21–23]. In the second round, the experts complete a second questionnaire, which is designed based on the previous round's feedback and the participants can either confirm or amend their previous responses, which are also provided to them as a reminder[24,25]. This process is reiterated until a consensus has been reached or until the number of pre-established rounds has been completed[26]. This study aimed to conclude the process after three rounds in order to prevent participant attrition[23]. The study was conducted through the Bristol Surveys online platform from September 2019 to December 2019, and the questionnaires were pilot tested with non-participants to ensure comprehension. Participants completed the questionnaire using a numerical identifier only, to ensure anonymity.

Selection of experts

Eligible participants were chosen due to their knowledge and experience on the TMexD. This was assessed as having at least one publication (including academic publications and grey literature) regarding the TMexD (e.g., nutrition transition in Mexico, traditional Mexican foods, Mexican food culture and traditions). To generate a heterogenous sample, the experts invited included dietitians, other health professionals (e.g., medical doctors, epidemiologists), anthropologists, culinary arts professionals, and economists. Participants were identified through adapted selection criteria recommended for Delphi studies[24] (Supplementary materials, Figure S1). The online questionnaire was only sent to experts who agreed to participate, and the follow-on questionnaires were sent only to those completing the previous round. We attempted to maintain high participation rates by using personal communication, questionnaire reminders and short time periods between rounds[21,23].

First round

Since we previously conducted an extensive systematic review on the topic that highlighted the foods and food groups characterised as 'traditionally Mexican'[14], the first Delphi round consisted of a questionnaire with mostly closed-ended questions (Supplementary materials II), rather than the original Delphi format of open-ended questions[15,16]. This practice is common when previous research on the topic has been conducted[16,27,28]. The questionnaire was divided into three major sections.

In the first section, participants were asked to rate the food groups to be included in a TMexD index. Agreement of inclusion in the index was measured using a 5-point scale (totally disagree,

disagree, indifferent, agree, and totally agree). The food groups included were based on results from the systematic review[14], but participants could also suggest additional food groups. Participants were also asked if all food groups should be equally important in the index and required equal weights (i.e., each food group should be awarded one point if its recommendation in the index is met), or if some food groups required a different weight (i.e., if some food groups should be awarded more points if their recommendation is met). Participants were asked to suggest the quantities in which the aforementioned food groups were consumed in the TMexD, as intended for healthy adults. For this purpose, participants could indicate both the weekly frequencies and daily portions consumed in the TMexD. The list of weekly frequencies ranged from 0 to 7 (0, <1, 1, 2 … to 7) and the list of daily portions ranged from 0 to >7 (0, <1, 1, 2 … to 7+). For example, if participants considered that two portions of fruits were consumed in the TMexD every day, they would have selected 'seven' in the weekly frequency and 'two' in the daily portions. The participants were asked to calculate these quantities based on images of standard portion sizes and descriptions of common measurements (e.g., pieces of fruit, handful, size of the palm) (Supplementary materials II).

In a second section, participants were asked to report on whether some traditional food-related habits should be included in the index. 'Cooking your own meals', 'eating with family and friends' and 'using traditional cooking techniques' were provided as random habits that characterise other traditional diets[30]. Participants could select these habits using a 'yes/no' answer format, and they could also suggest other habits. Finally, they were asked to indicate how these elements needed to be scored in the index (i.e. how many points each habit should be awarded).

In the third section of the questionnaire, participants rated all the individual foods to be included into the food group categories. The foods in this section (and their classification in the food groups) were extracted from our recent systematic review on the TMexD[14], although foods absent from the Mexican food guidelines[31–33] were omitted, as these might not represent current food practices. Participants could nominate additional foods and add comments in each food group section. Participants rated each food item using a 3-point scale (disagree, indifferent, agree). Unlike the 5-point scale used in the first section of the questionnaire, this simpler scale was used to facilitate completion of the questionnaire, especially since this section included up to171elements and the maximum amount of time recommended to complete a Delphi questionnaire, to reduce participant attrition, is 30 minutes[21,24]. Both the 3-point and the 5-point scales were chosen to allow participants to provide a 'neutral' opinion, should they feel undecided to either include or exclude some foods into the index[21,23]. This approach was considered particularly important if participants

were unsure about the meaning of some foods suggested in the list, although a brief explanation of some uncommon foods was provided (Supplementary materials II). Lastly, participants were asked to indicate whether foods that were not deemed 'traditionally Mexican' should also be considered when assessing TMexD adherence with the index (e.g., when consuming fruit not included in the index, whether this should be awarded a score, or count towards the total portions of fruits consumed, or not).

Second round

Since 27% of participants requested clarification on the term 'traditional diet' in order to rank the food groups and items that could be included in the index, the second-round questionnaire began by clarifying that the term ´traditional Mexican diet´ varies largely in the literature and that, while a systematic review was conducted to help inform the questionnaire[14], the experts' additional input was necessary to select the specific items that were needed to measure adherence to a traditional Mexican diet in present time. Participants could then complete the original questionnaire again while having this information, as well as their own and the whole group's first round responses.

Some additional minor changes were applied to the second-round questionnaire following participant feedback. In the first section, the food groups suggested by participants were included. Another modification was amending the group 'maize products', as 32% of participants commented on the complexity of suggesting quantities and food items in such a mixed food group. As such, this group was split into 'maize products' (e.g., *tortilla*) and 'maize-based dishes' (e.g., *tacos*). In the food-related habits section, the participants' suggestions were added and, due to feedback regarding the complexity of measuring these items in an index, participants could now vote on how frequently they thought these habits were performed in the TMexD. In the last section, the individual foods suggested by participants in the first round were also added. However, in this section, other questions were introduced (with yes/no answers) to refine these elements in the index (Supplementary materials I, Table S1). For example, based on participant feedback, we asked if the group 'maize-based dishes' should include both non-fried and fried foods.

Third round

The last round aimed to achieve consensus in all elements to be included in the index. With regards to food groups, those groups for which consensus had already been achieved in previous rounds were eliminated from this section and included in the index (Supplementary materials I, Table S2). The groups for which $\geq$50% of participants 'disagreed' should be included were eliminated from this round[34] (i.e., reptiles). Although some authors recommend not excluding data from the last

round[23], this measure can reduce participant attrition[23]. Additionally, recommendations to not exclude data in the last round refer mainly to studies using an open-ended question in the first round and not to studies where participants had already completed the same questionnaire in two separate occasions, as in this study. The group 'sugars and sweeteners' was separated into 'natural sweeteners' and 'sweet products', after 78% of participants suggested so in round 2 (Supplementary materials I, Table S1).

To achieve consensus on the quantities of food groups consumed in the TMexD index, only options representing most votes in the previous round were provided. For this purpose, food groups were divided in two categories: foods consumed daily (i.e., foods whose consumption was voted as 'seven days per week' by ≥50% of participants in round two) and foods consumed less frequently (i.e., foods whose consumption did not meet the >50%cut-off). For foods consumed daily, the third round required participants to select the portions consumed in a day, while for foods consumed less frequently, participants selected the portions consumed per week. The available answer options were those representing the majority of votes in previous rounds (i.e., excluding minority votes of <11% in round two[35]) (Supplementary materials I, Table S3). To identify the weekly portions of the food groups consumed less frequently, the weekly frequencies were multiplied with the daily portions consumed, as suggested by each participant in the previous round.

To further explore how food-related habits could be incorporated in the index, participants were asked to report how frequently they thought these habits were carried out and other aspects related to these habits (e.g., which specific cooking techniques could be considered).

With regards to individual foods, those that achieved consensus in round two were eliminated from this questionnaire and included in the index. Additionally, the foods that were voted as 'disagree' by ≥50% of participants were also eliminated from this round and excluded from the index (i.e., soda). As in the second round, some questions (with yes/no answers) were introduced to refine some elements in the index (Supplementary materials I, Table S1). Finally, as suggested by some participants, we asked participants to provide their personal reasoning for including or excluding foods and habits into the TMexD index.

Analyses and selection of elements in the index

The criteria used to include items into the index were different for the different sections of the questionnaires. For food groups, which was the main objective of the study, we used a percentage of agreement (either 'agree' or 'totally agree') of ≥75%,a mean of ≥2.75 (in the 5-point scale), and

a coefficient of variation of ≤0.50as inclusion criteria[22,26,34,36]. Percentage of agreement and mean thresholds are the most common measurements of consensus in Delphi studies[26], while coefficients of variations are the most recommended measurements for variability of responses[37]. Only food groups that met all these criteria were included in the index. Since some authors recommend using median values and interquartile ranges (IQRs) instead of means[21,23,38], we also used these criteria; all the results were the same (Supplementary materials I, Table S4). For the food group quantities, we intended to use the majority of votes (i.e.,>50%) to establish the recommended portions for consumption in the final index. However, this was not possible for all food groups and, when the 50% cut-off was not achieved, we used plurality instead (i.e., agreement by a large portion of the sample but less than 50%[36]). To specify if the quantities in the index referred to minimum and maximum quantities suggested, we used the Mexican food guidelines as reference[39]. As such, foods recommended in the guidelines were expressed as the minimum quantities to reach adherence to the TMexD (e.g., fruits and vegetables), while discouraged foods were expressed as maximum quantities allowed (i.e., foods containing saturated fat, cholesterol, and sugar).

As for the specific food-related habits, we included those that reached 67% agreement on inclusion, as suggested in the literature for yes/no questions[22]. We used majority of votes (i.e., >50%) to measure how often these should take place for someone to adhere to the TMexD.

For including foods into the different food groups, a ≥75% percentage agreement was used as the cut-off point. For questions using yes/no answer options (e.g. should the 'maize-based dishes' group include both non-fried and fried foods?), a 67% cut-off was assumed as agreement. For all sections, if a consensus was not reached for either inclusion or exclusion, the item was excluded, so as to include only elements agreed by most participants.

Statistical analyses were conducted in Stata/MP version 15.1 (StataCorp LLC, College Station, TX, USA). Frequencies for open-ended questions were calculated in Microsoft Excel. NVivo (version 12, QSR International Pty Ltd, Doncaster, Victoria, Australia) was used to code and identify, using thematic analysis, the emerging themes related to participants' conception of traditional diets[21], both in the question asked in the last round and in all comments provided by participants in all rounds.

Results

Panel characteristics

Of the 51 experts who were invited to participate in the study, 27 accepted, and 17 completed all three questionnaires (Figure 1). Participants worked in research (59%), non-governmental organisations (18%), teaching (14%), and consultancies (4%).

Traditional Mexican diet index

The food groups included in the TMexD index are presented in Table 1. The scores range from 0 to 21 points, where higher scores reflect higher adherences to the TMexD. The food groups for which no consensus about their inclusion was reached in any of the rounds were 'alcoholic beverages', 'fish and seafood', 'natural sweeteners', 'sweet products', 'insects', '*chile*', and '*quelites*'.Since only avocado and vegetable oils were included in the food group fats and oils, the group was renamed to 'vegetable fats and oils'. The food group quantities (Supplementary materials I, Tables S5), point allocation criteria (Supplementary materials I, Tables S6-S8), and food-related habits (Supplementary materials I, Tables S8-S10) in the TMexD are also presented in Table 1. When it was not possible to reach majority agreement in the portions consumed in some food groups, the quantity voted for by most participants (i.e., from 35.3% to 47% agreement) was used to represent recommended portions (Table 1).

Individual foods in the traditional Mexican diet index

The foods included in each food group (Supplementary materials I, Table S11) are presented in Table 2. Approximately 33% of foods did not reach consensus of inclusion in the index. Most participants in all first (46% agreement), second (56% agreement), and third (71% agreement) rounds suggested that foods not mentioned in the index should also count towards the total consumption of foods in that food group (Supplementary materials I, Table S12). For example, if a person consumed a fruit not listed in Table 2, that fruit would still count towards the portions of fruits consumed.

Participants' rationale for selecting items to be included in the index

Most participants considered foods highly consumed in Mexico (55% of participants) and past habits (50% of participants) as their criteria to select the items in the TMexD index. Other aspects considered, in order of importance, were nutritional aspects, foods consumed in all regions, non-industrialised products, low-cost foods, foods produced or native of Mexico, and those compatible with current environmental issues (Supplementary materials I, Table S13).

Discussion

The aim of this study was to develop an index for evaluating adherence to the TMexD, using a Delphi consensus study. We used an objective and systematic approach, by involving expert opinion, to propose an index with the food groups (including food quantities), food-related habits, and individual foods that reflect a TMexD. To our knowledge, this is the first study to use the Delphi technique to create a dietary pattern index, and to create an index to measure adherence to the TMexD. This new index could aid in determining the association of this dietary pattern with health outcomes and could prove indispensable when developing future intervention strategies to promote traditional and sustainable diets and prevent NCDs in Mexico.

The proposed TMexD index includes a diverse combination of food groups, most of which are plant-based, such as grains (maize and other grains), legumes, vegetables, fruits, herbs, nuts and seeds, and tubers. Animal foods (i.e., meats, dairy products, and eggs) are also present in the index, although in lower quantities. Plain water, fats and oils (in the form of avocado and vegetable oils), as well as home-made beverages and maize-based dishes, were considered to form part of the TMexD, and were therefore included in the index.

Some foods were omitted from the index, either because they did not meet the consensus for inclusion or because participants did not consider them to be part of the TMexD. These included alcoholic beverages, fish and seafood, natural sweeteners, sweet products, insects, reptiles, *quelites* (wild greens), and *chile*. Perhaps the potentially complex criteria that participants used to select 'traditional' foods was the reason why these foods were not deemed to characterise the whole TMexD. For instance, although health reasons were quoted as justification for selecting traditional foods, sweetened beverages, which are not compatible with health guidelines, were considered characteristic of the diet. Similarly, while past dietary habits were perceived as a main reason for classifying traditional foods, some of the foods consumed mostly in past times, such as reptiles, were excluded by most participants. The same complex criteria could have also been applied by participants for selecting the specific foods in the food groups. For example, although oats are considered healthy[39], they were not included in the index. The combination of different criteria to define a 'traditional diet' has been recommended previously[40] and it highlights the value of involving heterogenous expert opinion and an objective methodology in creating an index to measure adherence to the TMexD.

Health and the traditional Mexican diet index

While the association of adherence to the TMexD index and health has not yet been evaluated, the proposed TMexD index shares several similarities with other healthy traditional diets. For example, while the foods contained in each food group might differ, both the Mediterranean diet[41] and the TMexD index encourage a high intake of plant-based foods. In fact, in the current index, foods with a higher weight (i.e., those awarded more points than others when their recommended consumption is achieved) were plant-based (i.e., maize, legumes, and vegetables), containing large amounts of fibre, diverse micronutrients, and antioxidants[30]. Similarly, the index recommends only a limited number of beverages and maize-based dishes, which are generally considered unhealthy foods[39]. Since both these types of foods have long been part of the Mexican culture[14], establishing a limit on their consumption might be more feasible than discouraging them altogether.

The quantities of foods contained in this index are also fairly compatible with current Mexican food guidelines, suggesting that the TMexD is consistent with what is currently considered a 'healthy' diet. The proposed TMexD index additionally incorporates some food-related habits relevant in traditional lifestyles [30,39,40,42] and associated with healthy eating patterns, such as consuming home-made foods, eating with others and buying foods from local markets[43–45]. However, further research is needed to establish associations of this dietary pattern with health outcomes. Future studies could also evaluate the validity of this index by examining the macronutrient and micronutrient adequacy of the index against other indices of a healthy diet in Mexico[46,47]. Once validated, the index could potentially be used as an interviewer-administrated or self-scored tool to quickly assess adherence in research (e.g., intervention studies) or clinical practice.

Food sustainability and the traditional Mexican diet index

The diet portrayed in this index could also be a step forward toward the measure of sustainable diets in Mexico, as there is currently limited evidence on the subject[48]. Foods utilising higher levels of energy, soil, and water resources, and with higher greenhouse gas emissions, such as meats and dairy products, are currently recommended in low amounts[9,30,49]. Although higher quantities of animal foods are recommended in Mexican food guidelines[39] (i.e., approximately 530-730g per week, as opposed to 240 g recommended in the TMexD index), the proposed index allows for substituting them with potentially more sustainable sources of protein like legumes and, to lesser extents, grains, vegetables, and nuts[30,49,50]. Other key aspects that are compatible with sustainable diets are dietary diversity[9,18,50] and buying food locally[9,48,49,51]. The present study does not claim to present the TMexD as an index to measure diet sustainability directly, as there is yet no clear definition of sustainable diets[52] and these might vary by region[53]. However, the present index does share similarities with current sustainable food metrics[18] and could serve as a basis for the

study of sustainable food systems in Mexico. Future studies might consider evaluating key aspects of sustainable diets to the TMexD index developed in this study. For instance, further research could evaluate the costs, environmental impact, biodiversity and food security aspects associated to this dietary pattern.

Strengths and limitations

Several procedures were implemented to improve validity in this Delphi study. First, a heterogeneous group of experts participated, and the sample size was sufficient to provide a variety of responses[16,21,22], which increases the quality of the data produced[15,17–19,54]. Second, we maintained high participation rates[15,18], which minimises the risk of false consensus by maintaining minority opinions in subsequent rounds[28,55].Third, participation in the study was anonymous, which prevents group domination[56] and conforming to group opinion[15,16]. Fourth, participants made comments and suggestions when completing the questionnaires, and they received feedback between rounds, which improves the quality outcomes by challenging previous assumptions and by leading to reasoned argument[17,54]. Lastly, the use of an extensive systematic review on the topic to develop the questionnaire[14], and the expert's input was useful for developing a high-quality TMexD index, representing not only the foods and the food quantities consumed in the TMexD, but also the food-related habits associated with traditional eating and with national cultural heritage[30,42,57], which complement previous tools that measure adherence or promote this dietary pattern[12,13].

The limitations of this study must also be acknowledged. First, some participants expressed confusion over the term ´traditional diet´ and the purpose of creating a TMexD index. While the recruitment email did explain the aim of the study, some participants might have used biased perspectives to respond to the first-round questionnaire. Nevertheless, we extensively clarified this issue in the second round and participants had a second opportunity to select the index´s elements. For this reason, consensus was not measured (and no food elements were dropped) after the first round, and participants could still suggest elements to be included in the index in the second round. In addition, results are presented separately for each round so as to show potential differences in responses between rounds.

A second limitation was the use of different criteria to define consensus. This procedure was followed because different sections of the questionnaire were presented in different formats (e.g., 5-point scales versus yes/no answers). Essentially, these diverse formats were applied given the large amount of questions in the survey, as to maintain response time under 30 minutes and ensure high

response rates[21,24]. However, most of these response options and consensus levels have been previously used in the literature[17,21,22,26,58] and were employed to evaluate the different aspects of the elements that need to be included in the index. Similarly, not all elements in the index achieved high levels of consensus (e.g., agreement by ≥75% of participants), such as the quantities of food groups consumed, and some detailed elements of the index (i.e., if *pinole* should be placed in natural sweeteners or in maize products). As such, the consensus criteria used to include those elements in the index were based on the most feasible option for attaining consensus in the study. Equally, since the elements that did not reach consensus for either inclusion or exclusion were omitted, some items present in the TMexD might not be measured by this index. However, these might not be as representative of the TMexD since these were not selected by most experts. Some authors recommend conducting a meeting to achieve consensus in these cases[56], although these meetings might be limited by time and location constraints, which should be avoided in Delphi studies[16]. Conducting a fourth round to overcome these issues[59], as in the original Delphi method[19], was also discarded as an option, as a fourth round has been associated with increased attrition rates due to participant fatigue[15,23,59] and no guarantee of consensus. Nevertheless, we reported a detailed description of the process followed to select the TMexD elements and the exact consensus level for each item at each round. If needed, we encourage researchers to adapt the present index for the items that did not reach consensus, based on the participants' responses.

Finally, we did not confirm with participants if our interpretation of their comments matched their views[15,19,28,54], nor did we explore the reasons why dissensus might have occurred in some elements of the index, which may have provided further insights[21].This approach was not performed due to numerous comment sections available in the questionnaire, and so confirming each comment that each participant made might have resulted in higher workload for the participants and possibly higher attrition levels. Similarly, some studies recommend asking participants their reasoning for selecting their final answers in the last round[19,24,28], especially if they decided to select an answer in disagreement with the majority of the group[59]. However, participants were encouraged to add comments in each section and at the end of each questionnaire, which is recommended as an additional approach to improve credibility[54].

Some limitations of the index developed were also identified. First, the index excluded some commonly consumed foods in Mexico, such as industrialised sweet products[4,5,45,61–63], which are detrimental for health[62,64] and the environment[48]. Including these items might have helped establish what the maximum recommended amount is for the consumption of these foods, similar to the cut-offs set for beverages and maize-based products. In particular, industrialised products are

highly consumed in Mexico[61,63] and not measuring their consumption in a Mexican index might not measure all relevant items in contemporary diets. Second, the food quantities represented refer to healthy adults and might require further modifications for other populations. Importantly, two participants explicitly mentioned the difficulties of recommending quantities of consumption (data not shown), as these often depend on individual needs. On a similar note, as in most studies involving food estimations, some participants might have miscalculated the food groups quantities in the index, leading to potentially under- or over-estimated recommendations for some food groups. Nevertheless, we carefully selected the participants to include only experts on the TMexD, and we provided examples of standard portion sizes, as recommended in the literature[60], to facilitate estimation of the food quantities. Third, the present index measures adherence to the different food groups in the TMexD by suggesting only lower or upper thresholds of consumption, but not both. Specifically, the index presents the minimum quantities needed to reach adherence for foods recommended in food guidelines (e.g. maize products), but not the maximum quantities. As such, individuals exceeding recommendations of these foods would still adhere to the TMexD, even if exceeding these recommendations might not be optimal. Likewise, the index does not specify some nutritious characteristics of some food groups. For example, it does not clarify if 'maize products' refers exclusively to unrefined forms of maize, which is generally regarded as healthier, as it contains a larger micronutrient and fibre content[65,66]. However, these represent low-energy dense foods which increase satiety when consumed in low quantities and consuming them might displace other less healthy foods in the diet, such as industrialised foods[67]. Finally, dietary intakes and food culture might differ in the different geographical regions of Mexico[14]. However, the proposed index was developed as a tool to be used in epidemiological research and at a national level, and thus, it is aimed at the general population.

Despite these limitations, this study provided the first comprehensive proposal for an index to measure adherence to the TMexD. As such, researchers are encouraged to adapt the present index, including foods and food-related habits, to current epidemiological concerns and different population groups and geographical regions.

Conclusion

This study developed a comprehensive index to assess adherence to the TMexD, using the Delphi technique through consulting experts in the TMexD, an approach which has not been used to develop traditional diet indices to date. We believe the proposed index might be superior to earlier TMexD indices, as it not only establishes the foods and food groups that are traditionally Mexican, but also the food quantities and food-related habits reflecting a TMexD. The findings showed that

the TMexD index is particularly characterised by foods of plant origin, rendering this an important tool to potentially promote not only a healthy, but also a sustainable diet. More research is needed to examine the association of the TMexD, as operationalised by the proposed index, with health outcomes, and establish whether the TMexD index could be used as an intervention strategy to promote a healthier and sustainable diet. The index could also potentially be further adapted to better reflect the TMexD of specific populations and Mexican regions.

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Table 1. Traditional Mexican diet index

	Criteria to meet recommendation	Points awarded if criteria are met
Food groups		
Maize products	≥4 tortillas or *tostadas*, or 60 g of *totopos* per day	2 points each
Legumes	≥1 cup of cooked legumes per day	
Vegetables	≥3 cups of raw or 1 ½ cup of cooked vegetables per day (240 g approx.)	
Fruits	≥2 cups of fruit per day (160 g approx.)	1 point each
Beverages	≤1 cup of cacao drinks, *atole*, or coffee (with milk), or 2 cups of *aguas frescas* per day	
Herbs and condiments	Cooking with these ingredients at least once a day[a]	
Nuts and seeds	≥30 g per day[a]	
Vegetable fats and oils	≥2/3 avocado or 2 teaspoons of vegetable oil per day	
Plain water	≥6 glasses per day[a]	
Other grains	≥2 cups of rice or toasted amaranth per week[a]	
Tubers	≥1 ½ large potato or cooked tuber per week[a]	
Meats	≤240 g of cooked meats per week	
Dairy products	≤90 g of cheese and *requesón* per week[a]	
Eggs	≤4 eggs per week[a]	
Maize-based meals	≤1 *tamal or huarache*, 1 bowl of *pozole*, 1 cup of *esquite* or 1 prepared *elote*, or 2 *tacos*, *quesadillas*, *sopes*, gorditas, *tlacoyos*, *chalupas* per week	
Food-related habits		
Consuming home-made meals	Consuming meals cooked at home ≥1 per day	1 point each
Socialising at meals	Eating with family, friends, and colleagues ≥1 per day	
Buying foods locally	Buying foods at markets and *tianguis*[b] ≥1 per week	

[a]This quantity did not reach the consensus of ≥50% participant agreement, but was included based on plurality of votes (i.e., agreement by a large portion of the sample but less than 50%) to provide a specific recommended amount. [b] Refers to a traditional open-air market, which occurs on certain days of the week.

Table 2. Composition of food groups in the traditional Mexican diet index

Food group	Foods included in food group
Maize products	Tortillas and other maize presentations (*tostadas*, *totopos*).
Legumes	Beans, lentils, chickpeas, fava beans.
Vegetables	Squash, *chayote*, *nopales*, tomato, green tomato, *quelites*[a], mushrooms, *guaje*, carrot, lettuce, squash blossoms, radish, green beans, spinach, chard, cucumber, *huitlacoche*, *chilacayote*, cauliflower, cabbage.
Fruits	*Anona*, *capulín*, plum, guava, *jícama*, *mamey*, prickly pear, *zapote*, *guanábana*, citrus fruits[b], mango, apple, melon, *nanche*, papaya, pear, pineapple, *pitahaya*, banana, *tejocote*, watermelon, *xoconostle*, *chicozapote*, *pitaya*, pomegranate.
Beverages	Cacao drinks[c], *atole*, *aguas frescas*, and coffee. Includes sweetened beverages, but industrialised beverages are excluded.
Herbs and condiments	Onion, *chile* or *salsa*, *achiote*, *acuyo* or *hoja santa*, garlic, *chipilín*, coriander, epazote, parsley, pepper, vanilla, *tequesquite* (mineral salt), cinnamon, clove
Nuts and seeds	Pumpkin seeds, chia seeds, sesame seeds, peanuts, *chilacayote* seeds, pecan nuts, sunflower seeds.
Vegetable fats and oils	Avocado, vegetable oil.
Other grains	Amaranth, rice.
Plain water	Plain water.
Tubers	Sweet potato, potato, yucca, *chinchayote*.
Meats	Turkey, *guajolote*, chicken, rabbit, chevon, pork, beef, hen.
Dairy products	Cheese and *requesón.*
Eggs	Chicken and *guajolote* eggs.
Maize-based dishes	*Tamales*, *pozole*, *quesadillas*, *tacos*, mixed dishes (*sopes*, *gorditas*, *huaraches*, *tlacoyos*, *chalupas*, *tlayudas*), *esquite* and maize on the cob.

[a]Includes *papaloquelite*, *verdolaga*, *huauzontle*, *chaya*, etc. [b]Includes orange, lemon, lime, mandarin, and grapefruit.

[c]Includes all cacao drinks like *pozol*, *tascalate*, *tejate*, and *chilatole.*

174 **Figure 1.** Participant flow diagram